Irish Aviation Authority The Times Building 11–12 D'Olier Street Dublin 2, Ireland www.iaa.ie Safety Regulation Division	Údarás Eitlíochta na hÉireann Foirgneamh na hAmanna 11–12 Sráid D'Olier Baile Átha Cliath 2, Éire Rannán na Rialachán Sábháilteachta	AERONAUTICAL NOTICE No. A.16 ISSUE 9 DATE 06.09.19	

USE OF UNLEADED PETROL (MOGAS) IN CERTAIN LIGHT AIRCRAFT

Introduction

This Notice gives guidance to owners/operators of certain light aircraft, not subject to Regulation (EU) No 2018/1139 (EASA), about the use of alternate fuel in single engine aeroplanes of 2,730kg MTOM and below operating on a Flight Permit. These aircraft are defined in Annex I to Regulation (EU) No 2018/1139 and commonly referred to as Annex I aircraft.

For Annex I aircraft, operating on a national Certificate of Airworthiness, the fuel used may only be changed in accordance with an approved modification. Such modification may be approved by the Irish Aviation Authority (IAA). To request such approval, contact the IAA aircraft registration and design control division (registration@iaa.ie).

For aircraft operating on a Flight Permit, suitable fuel(s) for use in that aircraft is usually listed in the Aircraft Flight Manual, Pilot's Operating Handbook or equivalent. The owner is fully responsible for any changes/alterations to an aircraft, such as the fuel it uses.

Alternate Fuels

Guidance regarding the effects of changing fuel type is given in Appendix I to this notice. Owners should review this document when considering changing the fuel type used.

Appendix II to this notice provides additional information for owner/operators using Unleaded Petrol (Mogas) in their aircraft.

The IAA takes no responsibility for the infringement of manufacturer's warranty, accelerated deterioration of the engine/aircraft component, or any other long-term effect of using unleaded petrol or other alternative fuel. The user accepts that there is an increased risk of engine failure when using fuels other than those originally deemed suitable for use.

This notice replaces Aeronautical Notice Number A16 at issue 8, which should be discarded.

Chief Executive

Irish Aviation Authority

Appendix I

Guidance material for reviewing alterations for the use of alternate fuel(s)

When considering using alternate fuel in your aircraft, the following should be considered;

1. The aircraft is a single engine aeroplane of 2,730kg MTOM and below operating on a Flight Permit.
2. STCs (approved by the FAA or EASA) for the use of an alternate fuel may be accepted.
3. Additional maintenance/inspection requirements, as required, may form part of the alteration e.g. Inspect engine pipe routings, piston compression ratios, install fuel components, filters, elastomer pipes and seals resistant to chemical attack by unleaded fuels, carburettor ice protection provision/heating.
4. Conditions of flight may require alteration e.g. altitude restrictions etc.
5. Additional precautions may be necessary. See Appendix II for details of precautions required when using Unleaded Petrol (Mogas).
6. Additional placards and a Flight Manual Supplement, or equivalent, may be required as part of the alteration. Examples of placards are included below.
7. If the alternate fuel is Unleaded Motor Gasoline, then there may be considerations with regard to ethanol content.
8. Records of fuel supply should be maintained (date, location of purchase, quantity purchased, method of storage and the necessary aircraft log-book entries stating the use of Unleaded Petrol (Mogas)).

The IAA takes no responsibility for infringement of manufacturer's warranty, accelerated deterioration of the engine or airframe components, or any other long-term deleterious effects of using alternate fuels.

Placards

A placard shall be fitted adjacent to each fuel filler point stating the fuel which is permitted to be used e.g.

UNLEADED PETROL

Figure 1 - Fuel filler decal example

Aircraft using Unleaded Petrol (Mogas) may have a placard shall be fitted on the instrument panel, or another location in clear view of the pilot during flight stating;

USE OF UNLEADED PETROL

- Fuel must be fresh, clean, and free from water and alcohol (if applicable).
- Inspect fuel system non-metallic pipes and seals daily for deterioration and leaks.
- Verify correct functioning of the carburettor heating system.
- Verify take-off power prior to committing to take-off.
- Fuel tank temperature not to exceed 20° C.
- Fly below 6,000ft.
- **Carburettor icing and vapour-lock more likely.**

Figure 2 – Example of cockpit decal when Unleaded Petrol is used.

Appendix II – In relation to the use of alternate fuels

Recommendations for owners/operators using Unleaded Petrol (Mogas) on an engine/aircraft combination.

As Unleaded Petrol /Motor Gasoline (Mogas) is the most common alternate fuel used in aircraft and carburettor icing has been identified as a contributory factor in a number of events in Ireland, the Appendix gives information to the user of precautions which should be taken when using Mogas.

The flight and landing characteristics of certain aeroplanes operating on a Flight Permit are designed to be such that an engine failure resulting in partial or total loss of power only is not an unacceptable safety risk. However, the user shall fully accept that there is an increased risk of engine failure when using fuels obtained from filling station forecourts

1. Precautions

1.1 - The fuel must not be rendered unfit by storage, contamination etc.

1.2 - Use only freshly obtained supplies. Avoid long storage periods in the aeroplane fuel tank or in containers.

1.3 - The fuel must be checked for the presence of water and alcohol, as applicable, prior to the first flight of the day. (Refer to EGAST Safety Promotion Leaflet 'Piston Engine Icing', SFAA Special Airworthiness Information Bulletin CE-07-06)

1.4 - During the daily check and other maintenance inspections, pay particular attention to non-metallic fuel pipes and seals for signs of leakage or deterioration.

1.5 - Pay particular attention to the serviceability of carburettor heating (if fitted). If carburettor heating is selectable, ensure that a satisfactory RPM drop is obtained when heating is selected on during pre-take-off checks.

Note: If there is an increase above the original engine speed afterwards, it shows that ice was already present when heating was selected on. During flight make regular selections of full carburettor heat lasting at least 15 seconds duration; longer if your engine is particularly prone to carburettor icing.

1.6 - The ability to maintain take-off power must be verified before the aircraft is committed to completing a take-off.

1.7 - Please report any problems encountered involving Mogas to the IAA Airworthiness Standards Department and the AAIU, as applicable.

1.8 - Remember, Carburettor Icing and Vapour-Lock are more likely to be encountered when operating on Mogas.

2. Carburettor Heating

Carburettor icing is more likely when using Mogas because of its volatility and water content. If no carburettor heating is available and reliance is placed on 'under-cowl temperature' for carburettor ice protection, ensure that under-cowl temperatures are not being accidentally reduced due to loose or worn baffles, air seals etc. Where possible, it is recommended that a carburettor heater is fitted.

3. Potential adverse effects of operating on Unleaded Petrol (Mogas).

1. The stability of Unleaded Motor Gasoline (Mogas) in storage is not as good as for Avgas. Consequently, over time Mogas may suffer a loss of octane rating and form gum deposits that can cause intake and exhaust valves, and fuel metering valves to stick. The additives in the fuel are also chemically different and those in Mogas can cause corrosion and increase the amount of water in the fuel.
2. Lead additives are normally used to control the rate of combustion but in unleaded fuels these have been replaced with other components, such as aromatics. If the engine is not designed to operate on unleaded fuel then the different speed of combustion can result in hotter exhaust gasses, which can damage the crown of the pistons, the exhaust valves and their seats. Aromatics can also damage seals in the aircraft and engine fuel systems.
3. Mogas has a relatively high vapour pressure (the ease at which liquid turns into a gas) and is therefore much more susceptible to causing vapour lock in aircraft fuel systems, particularly at elevated temperatures and higher altitudes. So, although an aircraft may be able to operate on Mogas, other aircraft components have to be considered because of the potential for vapour lock within the fuel system, as well as potential adverse effects on seals and components. Therefore, approval to operate on Mogas is required for both the aircraft and engine.
4. Carburettor icing is more likely when using Mogas because of its volatility and water content.

The IAA takes no responsibility for infringement of manufacturer's warranty, accelerated deterioration of the engine or airframe components, or any other long-term deleterious effects of using alternate fuels.

4. Unleaded Petrol/Motor Gasoline (Mogas) containing alcohol

The use of Mogas containing alcohol is not permitted is most light aircraft.

In accordance with published European and National legislation, promoting the use of biofuels for motor transport, the percentage of alcohol contained in Mogas has increased. Users of Mogas containing ethanol/alcohol should be vigilant and understand the effects that such fuel has.

1. Most Mogas contains alcohol (ethanol), which can adversely affect seals and elastomers; it also affects the fuel's vapour pressure leading to an increased probability of vapour lock.
2. The ethanol absorbs water which increases the likelihood of carburettor icing.
3. An engine will use more fuel as the percentage of added alcohol increases. An approximate figure is that the engine must burn 3% more fuel to give the same power output if the fuel contains 10% ethanol.
4. Ethanol mixed with water is somewhat corrosive and may attack parts of the fuel system. In long-term storage, ethanol may oxidise with exposure to air. This process produces a mild acid solution which can attack fuel system fittings.
5. Ethanol can be particularly harmful to composite fuel tanks and/or their internal coating materials. Degradation of coating material may result in material disbonding and potentially blocking the fuel supply.
6. Long term exposure to ethanol damages some types of plastics (elastomers); therefore, items such as flexible fuel lines are subject to increased deterioration. Some of the elastomers used in old aircraft models and which are otherwise compatible with Avgas may deteriorate on contact with ethanol.